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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/709,616	11/13/2000	David W. Warren	12.150	4083

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William W Haefliger
Suite 512
201 South Lake Avenue
Pasadena, CA 91101

EXAMINER

LEUNG, JENNIFER A

ART UNIT PAPER NUMBER

1764

DATE MAILED: 11/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/709,616

Applicant(s)

WARREN ET AL.

Examiner

Jennifer A. Leung

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 August 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 and 15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 and 15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment

1. Applicant's amendment submitted on August 27, 2004 has been received and carefully considered. Claims 13 and 14 are cancelled. Claims 1-12 and 15 remain active.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claim 15 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. In particular, it is unclear as to where the limitation of, "the presence of the catalyst below 550 °F", is located in Applicant's disclosure. For example, page 10, line 16, of Applicant's specification states a temperature range of 400 °F to 550 °F. According to this citation, there is no support for temperatures below 400 °F.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1-12 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collins et al. (U.S. 5,458,857) in view of Amano et al. (JP 62-106834).

Regarding claims 1, 6 and 15, Collins et al. (FIG. 3, 4, 6, 7; column 8, line 19 to column 12, line 52; more specifically, column 8, lines 35-53; column 9, lines 35-54) disclose a thermally-integrated water-gas shift reactor comprising, in combination,

a waste-heat recovery steam generator **416** for the recovery of exothermic reaction heat to generate steam; and

a catalyst bed (i.e. a suitable low temperature shift reaction catalyst **438**) located within an outer region relative to the steam generator **416** (i.e., within shift reactor tubes **414**; column 8, lines 48-53), through which reformat gases flow (i.e., reformat flow from upper chamber **462** to lower chamber **464**);

wherein the outer region **414** is in heat transfer communication with the steam generator **416** in order to maintain the catalyst bed **438** within a predetermined temperature range for operation of an exothermic water-gas shift reaction (column 11, lines 7-19).

In view of the newly added structural limitations, FIGS. 3-7 of Collins only illustrate the steam generator **416** being located on the outside of the catalyst bed **438** (i.e., as best shown in FIG. 4, the steam generator **416** is located shell-side to surround the catalyst bed **438** located tube-side -- in tubes **414** -- of the heat exchanger). However, Collins further discloses that the

steam generator **416** may instead be configured as a “centrally located” waste-heat recovery steam generator, with the catalyst bed **438** “located entirely outside the generator,” within an outer region that extends at least part way about the steam generator **416**. Support is found in column 12, lines 31-33, wherein Collins discloses that,

“It is also possible to arrange the low temperature shift reactors to be on the shell side of the heat exchanger and pass the reactants through the tube side of the heat exchanger.”

Collins is silent as to the catalyst bed comprising “flow guide surfaces” (i.e., essentially fins) which extend helically and adjacent the catalyst **438**, such that the bed “extends helically” and all of the reformat gases flow only helically through the catalyst bed. However, Collins (column 12, lines 33-39) discloses that,

“It is also possible to use other suitable heat exchanger arrangements to transfer heat between the low temperature shift reactors and the steam generator, e.g, plate fin heat exchangers etc.”

Amano et al. teach an apparatus comprising an annular catalyst bed **1** as defined by the space between the outer peripheral surface of an inner cylinder **3** and the inner peripheral surface of an outer cylinder **4**, wherein the annular catalyst bed **1** comprises flow guide surfaces (i.e., spiral plates **15**) that extend helically adjacent to the catalyst, in order to direct all gases introduced through an inlet pipe **9** to flow only helically through the helical catalyst bed **1** and out through pipe **10**. (FIG. 1-3; Abstract).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to select the “flow guide surfaces” (i.e., spiral plate **15**) of Amano et al. as an appropriate “suitable heat exchanger arrangement” in the apparatus of Collins et al., on the basis of suitability for the intended use and absent showing any unexpected results, because the flow

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guide surfaces function to increase the heat transfer quantity to the catalyst bed, and furthermore, the flow guide surfaces direct the reaction gases to spirally flow through the catalyst bed, thereby shortening the required height of the bed, enhancing the contact probability of the gas with the catalyst, and increasing the reactivity of the catalyst, as taught by Amano et al. (see Abstract).

Regarding claim 2, no further structural limitations are recited, as the operating temperature of generator **416** is not considered an element of the apparatus. In any event, Collins et al. disclose, "The temperature of the steam generator **416** and therefore the temperature of the low temperature shift reaction catalyst **438** is controlled by regulating the temperature of the steam generator **416**," and catalyst **438** is ideally operated at a temperature between 140 °C and 220 °C (equivalent to 284 °F and 428 °F) and possibly a broader range of 110 °C to 250 °C (equivalent to 230 °F to 482 °F). (column 11, lines 7-19; column 12, lines 40-46).

Regarding claims 3-5, Collins et al. (FIG. 3, 4, 6, 7) disclose a suitable low temperature shift catalyst **438** may comprise a Cu/Zn catalyst; the apparatus having an inner wall that is in thermal contact with said generator **416**, such that the boiling water fluid (in water space **432**, steam space **434**) is located proximate the catalyst bed to heat the bed during start-up. As modified by Amano et al. above, the apparatus of Collins comprises a bed **438** that extends helically about generator **416**. (column 8, lines 45-51; column 10, line 68 to column 11, line 46).

Regarding claims 7, 9 and 10, the same comments with respect to Collins et al. and Amano et al. apply (see claim 1 above). However, their collective teachings are silent as to the annular space containing the bed being between 1 and 2 inches wide and the helical length of the bed being selected to define a gas hourly space velocity in the range of 500 hr⁻¹ to 2000 hr⁻¹. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention

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was made to select an appropriate width for the annular space and an appropriate length for the helical bed in the apparatus of Collins et al., on the basis of suitability for the intended use (i.e., for achieving a given production capacity and/or gas hourly space velocity) and absent showing any unexpected results thereof, since it has been held that changes in size involve only ordinary skill in the art, and where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Rose*, 220 F.2d 459, 463, 105 USPQ 237, 240 (CCPA 1955), *In re Aller*, 105 USPQ 233.

Regarding claim 8, Collins et al. disclose catalyst bed **438** is “sufficiently close” to said generator, as evidenced by the catalyst **438** being ideally operated at a temperature between 140 °C and 220 °C (equivalent to 284 °F and 428 °F) and possibly a broader range of 110 °C to 250 °C (equivalent to 230 °F to 482 °F). (column 11, lines 7-19; column 12, lines 40-46).

Regarding claim 11, Collins (FIG. 3, 4, 6, 7; column 8, lines 54-68; column 11, lines 29-46) disclose generator **416** comprises heat transfer conduits (start-up tubes **417**) that transfer heat from combustion products to boiling water fluid (i.e., in water space **432**, steam space **434**).

Regarding claim 12, Collins et al. (FIG. 3, 4, 6, 7; column 8, lines 36-68; column 9, lines 21-35) disclose generator **416** includes an upright vessel, said outer region **414** having an upper level inlet (via upper chamber **422**) and a lower level outlet (via lower chamber **464**), heat transfer conduit(s) (start-up tubes **417**) extending within said vessel and immersed within boiling water (located within water space **432**, steam space **434**) inwardly of said bed **438**, said conduit or conduits **417** receiving hot products of combustion from a combustion process (i.e. via combustion catalyst **429**), operable for transfer of heat to the boiling water, for generating steam.

Response to Arguments

4. Applicant's arguments filed on August 27, 2004 have been fully considered but they are not persuasive.

Beginning on page 7, under item B., Applicant argues,

“Motivation to combine Collins and Amano is lacking because Amano does not teach removal of exothermic heat to an inner centrally located steam generator; and Amano is concerned with the endothermic reforming reactors (see page 1 of inventor's comments).”

Beginning on page 8, under item D., Applicant argues,

“Motivation to combine Collins and Amano is therefore lacking, due to fundamental differences between endothermic and exothermic hot flow systems.”

The Examiner respectfully disagrees. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, the Examiner maintains that adequate suggestion for providing the helical flow guide of Amano et al. to the catalyst bed of Collins et al. can be found, for instance, in column 12, lines 33-39, of Collins, which teaches that “other suitable heat exchanger arrangements” may be employed. Specifically, “plate fin heat exchangers etc.” are suggested. One of ordinary skill in the art of heat transfer would have recognized that the helical flow guide of Amano et al. comprised a type of heat transfer fin. One of ordinary skill in the art of heat transfer would have also have appreciated the provision of fins

to heat transfer surfaces in order to improve cooling or heating efficiency (see Prickett, US 1,987,911, which evidences the conventionality of providing fins to heat transfer surfaces for improving heat transfer efficiency and controlling the temperatures of either endothermic or exothermic reactions). Furthermore, although the apparatus of Collins is concerned with the removal of heat from an exothermic reaction and the apparatus of Amano is concerned with the supply of heat to an endothermic reaction, one of ordinary skill in the art of heat transfer would have been motivated to combine the teachings of Amano to the apparatus of Collins, because both Collins and Amano are reasonably concerned with the same problem of improving the heat transfer efficiency of the catalyst system. Additionally, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). Amano does not require a centrally located steam generator, because the centrally located steam generator is provided by the primary reference to Collins et al. Amano was merely provided to illustrate the known use of a helical flow path in a catalyst bed for improving heat transfer efficiency.

Beginning on page 8, under item C., Applicant argues,

“Collins teaches LTS (low temperature shift) reaction using multiple LTS reactors disposed in a steam generator, so therefore he does not suggest an LTS reactor disposed outside of an inner steam generator.”

The Examiner respectfully disagrees. As indicated in the rejection above, Collins (column 12, lines 31-33) discloses that the location of the LTS reacts and the steam generator may be

reversed, such that the LTS reactor is disposed outside of an inner steam generator.

Beginning on page 8, under item E., Applicant argues,

“The specific temperature ranges and gas velocities... for this exothermic heat transfer system are nowhere suggested by Collins or Amano.”

Whether or not the specific temperature ranges and gas velocities are disclosed or suggested in the references of Collins or Amano is not germane to the patentability of the claimed apparatus, since expressions relating the apparatus to contents thereof during an intended operation are of no significance in determining patentability of the apparatus claim. *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969). Furthermore, inclusion of a material or article worked upon by a structure being claimed does not impart patentability to the claims. *In re Young*, 75 F.2d 966, 25 USPQ 69 (CCPA 1935); *In re Otto*, 312 F.2d 937, 136 USPQ 458, 459 (CCPA 1963). A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. See *In re Casey*, 152 USPQ 235 (CCPA 1967) and *In re Otto*, 136 USPQ 458, 459 (CCPA 1963).

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

As commented in the section titled “Response to Arguments”, Prickett is provided to illustrate the conventionality of providing fins to heat transfer surfaces for improving the

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heat transfer efficiency in exothermic or endothermic reactions.

* * *

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

* * *

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Leung whose telephone number is (571) 272-1449. The examiner can normally be reached on 8:30 am - 5:30 pm M-F, every other Friday off.

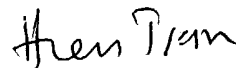
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications

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may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer A. Leung
November 23, 2004



**HIEN TRAN
PRIMARY EXAMINER**